

ACCESSION #: 9701130051

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Limerick Generating Station, Unit 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000353

TITLE: Manual Reactor Scram Resulting From a Leak in the Main

Turbine Electro-Hydraulic Control System Due to the

Failure of a Pressure Switch Support Bracket and Tubing

EVENT DATE: 12/06/96 LER #: 96-007-000 REPORT DATE: 01/06/97

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 90

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J.L. Kantner, Manager - Experience TELEPHONE: (610) 718-3400

Assessment, LGS

COMPONENT FAILURE DESCRIPTION:

CAUSE: B SYSTEM: TG COMPONENT: SPT MANUFACTURER: B070

REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 12/6/96, operators manually scrambled the Unit 2 reactor as a result of a degrading Electro-Hydraulic Control (EHC) system. Alarms and EHC system operating parameters indicated an EHC system leak. The operators conservatively initiated a manual shut down of the unit in advance of a probable automatic main turbine trip and reactor scram. An EHC system pressure switch support bracket developed a crack and failed due to main

turbine control valve vibration. The pressure switch tubing then cracked creating the EHC system fluid leak. The failed bracket was replaced with a modified bracket design, and the associated tubing was replaced. The remaining turbine control valve pressure switch brackets were also upgraded with the modified design. A comprehensive walkdown of the main steam system piping was performed to identify other piping supports and attachments that may have been degraded by vibration. An analysis of the turbine control valve and piping vibration will be performed through the next Unit 2 operating cycle to determine causes of the system vibration and corrective actions, as appropriate.

TEXT PAGE 2 OF 5

TEXT PAGE 2 OF 5

Unit Conditions Prior to the Event

The unit was in Operational Condition (OPCON) 1 at 90 percent power level. There were no systems, structures or components out of service which contributed to this event.

Description of the Event

At 2320 hours on December 6, 1996, the Unit 2 "Turbine Control Valve Fast Closure Trip" alarm annunciated coincident with a 'B2' channel half scram signal alarm. The Unit 2 Reactor Operator (RO) observed stable reactor and turbine operating conditions and verified that a turbine control valve fast closure had not occurred. An investigation into the cause of the alarm annunciation was initiated.

At 2332 hours, the "EHC Fluid Reservoir Low Level" alarm annunciated.

While investigating this alarm, the RO was directed by shift management to reduce reactor power for the purpose of eventually isolating the turbine from the reactor. The RO started reducing recirculation flow when the Equipment Operator (EO) sent to investigate the Electro-Hydraulic Control (EHC) system alarm reported to the main control room

(MCR) that the EHC system (EIIS:TG) fluid reservoir was at minus five (-5) inches and dropping.

At 2337 hours, the MCR Shift Supervisor ordered an immediate shutdown of Unit 2 in accordance with General Plant procedure GP-4, "Rapid Plant Shutdown to Hot Shutdown," due to a suspected EHC fluid leak with no available makeup and imminent loss of the EHC system with an eventual main turbine trip. The Unit 2 reactor was manually scrammed using the Reactor Protection System (RPS, EIIS:JC) manual pushbuttons, and all control rods were verified to be full in. The EHC fluid leak was isolated and the EHC system remained in service to support reactor pressure control through the use of the turbine bypass valves during reactor shutdown.

A four hour notification was made to the NRC at 0247 hours on December 7, 1996, in accordance with the requirements of 10CFR50.72(b)(2)(ii) since this event resulted in the manual actuation of the RPS. This report is submitted in accordance with the requirements of 10CFR50.73(a)(2)(iv).

TEXT PAGE 3 OF 5

Repairs to the EHC system were performed and the Unit was restarted on December 13, 1996, following completion of a brief planned outage that was performed during the unit shutdown.

Analysis of the Event

The RPS functioned as designed in response to the manual actuation of the system. All control rods fully inserted as a result of the manual scram

initiation. operations personnel controlled the-plant shutdown using the appropriate station procedures. The MCR Shift Supervisor made a conservative decision to take control of the plant and initiate a rapid plant shutdown when EHC system conditions were known to be deteriorating. EOs and supervisors, upon hearing the manual scram announcement over the public address system, were able to take additional actions to protect the EHC inventory and allow for the subsequent operation of the main turbine bypass valves for pressure control. There was no release of radioactive material to the environment as a result of this event. If a manual scram had not been performed, a main turbine trip and automatic reactor scram would have occurred as a result of low EHC system pressure. Operators would have been capable of safely shutting down the plant without the EHC system.

Cause of the Event

The cause of the event was that the support bracket (EIIS:SPT) for the Relayed Emergency Trip System (RETS) pressure switch (EIIS:PS), which provides the turbine control valve fast closure signal to RPS, was not designed for application in this type of environment. The pressure switch is mounted on the No.2 main turbine control valve (EIIS:PCV). Due to turbine control valve vibration, the bracket developed a crack and failed. The pressure switch then became unsupported resulting in cracked tubing which created the EHC system fluid leak. This leak resulted in the low pressure sensed by the pressure switch which caused the

inadvertent turbine control valve fast closure alarm signal and the B2 channel half scram signal. The subsequent EHC fluid leakage caused the EHC reservoir low level alarm to annunciate.

Corrective Actions

The failed bracket was replaced with a modified bracket design, and the tubing associated with the pressure switch was replaced. The support brackets for the turbine control valve fast closure pressure switches

TEXT PAGE 4 OF 5

on the other three turbine control valves were also replaced with the modified design. A comprehensive walk down of the main steam system (EHS:SB) piping was performed between the reactor and the main turbine to identify other piping supports and main steam system piping attachments that may have been degraded by vibration. Although several degraded items were identified and repaired during the planned outage, no failures that would have impacted the associated system functions were identified.

Although the Unit 1 turbine control valve fast closure pressure switch/bracket assemblies are of a different design, and the pressure switches are not mounted on the turbine control valves, Operations still performed a visual inspection of the pressure switch/bracket assemblies. No indications of degradation were observed.

Vibration probes have been installed on the Main Steam System piping in the area of the main turbine control valves to collect vibration data.

Analysis of this vibration data will be performed through the next Unit 2 operating cycle to determine causes of the system vibration and corrective actions, as appropriate.

Previous Similar Occurrences

In May 1996, the Unit 2 turbine had to be removed from service to repair a failed weld at a flange on the EHC supply piping to the No.3 control valve. During the walkdown to plan this repair it was observed that the control valves exhibited higher vibration levels at certain loads, and that the No.3 control valve exhibited higher vibration than the other valves at these loads. Because of the observed vibration levels and the belief that the failure of the weld may have been exacerbated by the vibration levels, monitoring instruments were installed at that time on the control valves and surrounding piping to monitor vibration levels at various power levels.

In October 1996, during a load drop, it was observed that the support bracket for PS-001-202A located on the No.3 control valve was broken. This broken support bracket was repaired at the time. Based on this observation, a visual inspection of the support brackets on the remaining turbine control valves was performed and no indications of degradation were identified. An Engineering Change Request (ECR) was generated to modify the No.3 turbine control valve pressure switch mounting bracket design during 2R04. Following the December 6, 1996,

manual scram this ECR was implemented on all four control valves. Data is still being collected to evaluate the steam-induced vibration and develop corrective actions as appropriate.

ATTACHMENT 1 TO 9701130051 PAGE 1 OF 1 ATTACHMENT 1 TO 9701130051
PAGE 1 OF 1

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10CFR50.73

January 6, 1997

Docket No. 50-353

License No. NPF-85

U.S. Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, DC 20555

SUBJECT: Licensee Event Report

Limerick Generating Station - Unit 2

This LER reports a Unit 2 manual reactor scram, a Reactor Protection

System actuation, resulting from a leak in the Electro-Hydraulic Control (EHC) system on the No. 2 main turbine control valve. The cause of the leak was failure of a pressure switch bracket caused by turbine control valve vibrations that resulted in cracked tubing in the EHC fluid system.

Reference: Docket No. 50-353

Report Number: 2-96-007

Revision Number: 00

Event Date: December 6, 1996

Report Date: January 6, 1997

Facility: Limerick Generating Station

P.O. Box 2300, Sanatoga, PA 19464-

2300

This LER is being submitted pursuant to the requirements of 10CFR50.73

(a)(2)(iv).

Very truly yours,

GHS/DBN

cc: H. J. Miller, Administrator Region I, USNRC

N. S. Perry, USNRC Senior Resident Inspector, LGS

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